

IBM 704 MUSIC

30	PSE	140	
31	RDS	321	
32	MSE	141	IS THIS FIRST CARD ?
33	TRA	(136	YES - SET CPY ADDRESS
34	PSE	141	NO
35	TRA	50	
36	CLA	62	CONSTANT = TO PROGRAM AREA
37	CPY	26	96 (-LAST CARD, ADDRESS = NO. OF NOTES & RESTS ON CARD)
40	ADD	26	L(96)
41	TMI	52	TO DELAY BEFORE PLAY
42	STA	44	
43	LXA	A	26 L(96)
44	CPY	A	[]
45	TIX	0001 A	44
46	STO	27	LAST ADDRESS MEMORY
47	TRA	31	
50	CLA	27	LAST ADDRESS MEMORY
51	TRA	37	
52	LXA	ABC	61 L(1777)
53	TIX	0001 A	53
54	TIX	0001 A	53
55	TIX	0001 B	53
56	TIX	0001 C	53
57	TRA	64	BEGIN PLAY

DELAY BEFORE PLAY

WORD FORMAT

5	12	345	6	17	18	19	20	21	35
DURATION				PITCH					

+ = NOTE
 - = REST
 * WHOLE WORD USED FOR REST

60 + 0000 000 000000 ZEROS

61 - 3777 777 777 7777 ONES

62 10000 000 000 00140 CONSTANT = TO PROGRAM AREA

63 NOTE & REST CNTR.

64 CLA 27 4 (LAST ADDRESS MEMORY) -

65 STA ~~71~~ 72

66 SUB 62 CONSTANT = TO PROGRAM AREA

67 ALS 21

70 STD 63 SET NOTE & REST CNTR.

71 LXD C 63 2 (NOTE & REST CNTR)

72 CLA C []

73 TIX 0001 C 77 STEP NOTE CNTR, IS SONG OVER

74 PSE 161 READ IN NEW SONG OR REPEAT
~~STOP BEFORE PLAYING NEXT SONG?~~

75 TRA 30 ~~NO~~ READ IN NEW SONG

76 ~~TRA~~ ~~HTR~~ 52 ~~30~~ YES REPEAT

77 SXD C 63

100 TMI 13 ϕ IS THIS WORD A NOTE OR A REST (REST = -)

101 NOP LXA C 61

102 NOP TIX 0001 C 102 } FOR LATER USE

103 NOP

104 PDX C

105 STA 25 FREQ. SET

106 PSE 141

107 PSE 142

TONE GENERATOR

110	PSE	143	
111	LXA	B	115 L(2)
112	LXA	A	25 L(FREQ. SET)
113	TIX 0001	A	113
114	MSE	141	
115	NOP	2	
116	LXA	A	25 L(FREQ. SET)
117	TIX 0001	A	117
120	PSE	141	
121	MSE	142	
122	PSE	142	
123	TIX 0001	B	112
124	MSE	143	
125	PSE	143	
126	TIX 0001	C	111

TONE GENERATOR

127	TRA	71	GET NEXT NOTE
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130	+ 0000 00 00 0001	ONE
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131	ADD	130
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132	TNZ	131
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133	TRA	71
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134

135

136	PSE	141
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137	TRA	3C
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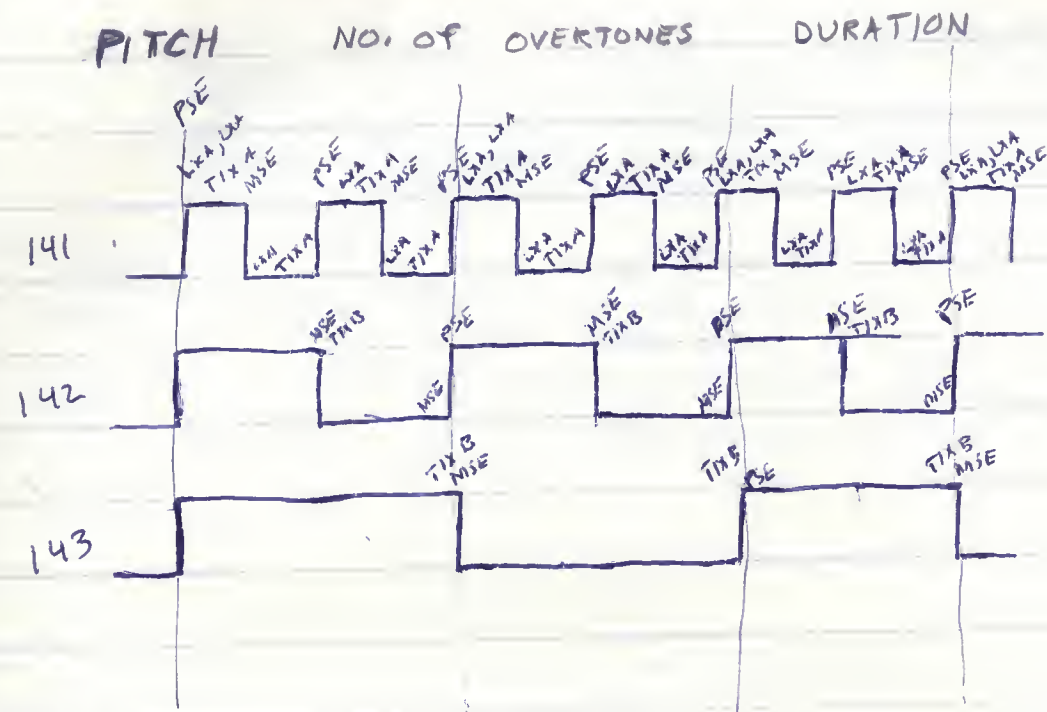
REST EXECUTION

(MAY REQUIRE ADDITIONAL TIME
CONSUMING INSTRUCTIONS)

~~5~~ 1 2 3 - 5 6 - 17 18-20 21 - 35
 DUR. #OVT. PITCH

+ = 1 NOTE WITH INDICATED OVT.

- = 2 NOTE WITH 3-5 INDICATING STEP (2nd NOTE ALWAYS HIGHER THAN FUNDAMENTAL INDICATED BY ADDRESS)



3 PSE 141

22 PSE 143

4 PSE 142

23 TRA TIX 0001 C 6 - FOR CONTROLLED DURATION

5 PSE 143

6 LXA B L(2)

7 LXA A L(FREQ. SET)

10 TIX 0001 A 10

11 MSE 141

12 NOP

13 LXA A L(FREQ. SET)

14 TIX 0001 A 14

15 PSE 141

16 MSE 142

17 PSE 142

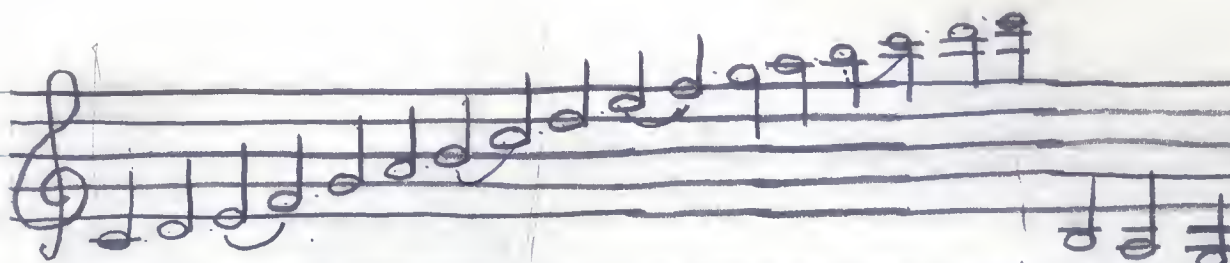
20 TIX 0001 B 7

21 MSE 143

6
3
5
3

BASIC MUSICAL FUNCTIONS

24



NOTE	C	D	E	F	G	A	B	C'	D'	E'	F'	G'	A'	B'	C''	D''	E''	B	A	G
FREQ.	256	288	320	391	426	480	512	576	640	682	768	853	960	1024	1152	1280	1472	240	213	192
FREQ RATIO	1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	2	$\frac{7}{4}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	4	$\frac{7}{4}$	$\frac{5}{4}$			

OVERTONES — HARMONICS

2^{nd} HARMONIC \equiv 1st OVERTONE

	C	C'	G'	C''	E''
EGBDF					
ACEG					
FUNDAMENTAL OR 1 st HARMONIC	256	512	768	1024	1280
		2 nd HARMONIC 1 st OVERTONE	3 rd HARM. 2 nd OVER.	4 th HARM. 3 rd OVER.	5 th HARM. 4 th OVER.
	1.C	2.C	3.C	4.C	5.C

C B, A, G, F, E, D, C,



213 170.6 144
256 240 192 160 128

$$\frac{41666.6}{\text{FREQ}} = \text{NO. OF INST. (24ms) TO GIVE REQUIRED PITCH}$$

FUND.	3 RD OVERTONE	FREQ. OF FUND	FREQ. OF 3 RD	OCTAL NUMBER TO GET FREQ.
C ^{II}	G ^{II}	1024	3072	6